

PURCHASE DESCRIPTION

WIDEBAND ELECTRONIC COUNTERMEASURES TEST SET

TSXAA-D

The following purchase description describes the individual units which make up an all solid state Wideband Electronic Countermeasures Test Set with a frequency range of 50 MHz to 40 GHz. The units are as follows:

1. Synthesized Microwave Signal Generator (50 MHz to 26.5 GHz)
2. System Controller
3. Countermeasures Test Set Accessories
4. Wideband Microwave Frequency Extender
5. Digital Voltmeter

PURCHASE DESCRIPTION

WIDEBAND MICROWAVE SIGNAL GENERATOR

- 1.0 GENERAL This procurement requires an all solid state, synthesized, wideband microwave signal generator covering a frequency range of 50 MHz to 26.5 GHz and including the ability to measure external frequencies* and external power levels. Plug-ins are NOT acceptable for any portion of this equipment. Additionally, it should be capable of driving and controlling the output of a 26-40 GHz frequency extender.
- 2.0 CLASSIFICATION The signal generator described herein shall meet the requirements of MIL-T-28800(), Type III, Class 5, Style E, Color R for Navy shipboard, submarine, and shore applications with the following modifications and exceptions:
- a. The Electromagnetic Interference requirements of MIL-T-28800() are limited to CE03, CS01, CS02 (0.05 to 100 MHz), CS06, RE02 (14 kHz to 10 GHz), and RS03.
 - b. The warm-up time is extended to one hour.
- 3.0 OPERATIONAL REQUIREMENTS
Note: FE means operating in Frequency Extension mode.
- 3.1 Frequency Characteristics
- 3.1.1 Range: 50 MHz to 26.5 GHz
 - 3.1.1.1 FE: 26-40 GHz
 - 3.1.2 Resolution: The displayed frequency resolution shall be at least 1 kHz.
 - 3.1.2.1 FE: At least 2 kHz
 - 3.1.3 Accuracy (CW mode): Same as reference standard
 - 3.1.4 Stability: Less than 1 pp 10⁹/h after one hour warmup
 - 3.1.5 Spectral Purity (at least the limits specified below)
 - 3.1.5.1 Harmonics/Sub-harmonics: At least -55 dBc
 - 3.1.5.2 Non-harmonics/Spurious: At least -55 dBc
 - 3.1.5.3 Phase Noise: At least -70 dBc/Hz at an offset 20 kHz
 - 3.1.5.4 Residual FM (BW = 50 Hz to 15 kHz)
 - < 200 Hz rms
 - < 400 Hz rms
- $$\begin{matrix} [F < 2 \text{ GHz}] \\ [F > 2 \text{ GHz}] \end{matrix}$$
- 3.1.6 Reference Frequency
- 3.1.6.1 Internal Reference Output: 10 MHz; 0.5 Vrms into 50 ohms
 - 3.1.6.2 External Reference Input: 10 MHz; 0.2 Vrms into 50 ohms
 - 3.1.6.3 External Reference Output: 10 MHz; 0.5 Vrms into 50 ohms
- 3.1.7 Lock Indicator: A light shall be provided which shall indicate that the output frequency is phase locked to the reference frequency.
- 3.2 Output Characteristics (L = Output level in dBm)

- 3.2.1 Impedance/Connector: 50 ohms / precision 3.5 mm male or female (SMA compatible)
- 3.2.1.1 VSWR: Less than 2:1 [L < 0 dBm]
- 3.2.2 Level: -99 dBm to +10 dBm leveled
- 3.2.3 Resolution: 0.1 dBm in a digital readout
- 3.2.4 Accuracy (displayed level vs measured output level)
 - ±1.0 dB from 0.05 to 18 GHz; ±2.0 dB from 18 to 26.5 GHz [L > -40 dBm]
 - Additional ±0.2 dB/10 dB step [L < -40 dBm]
- 3.2.5 Level Control Indicator: A light shall be provided which shall indicate that the output signal level is under active control of the feedback circuit in the leveling loop. An unleveled indication on this display shall mean that the output amplitude is unleveled regardless of the actual amplitude measured at the output.
- 3.3 Modulation Characteristics
- 3.3.1 Pulse Modulation (internal)
 - 3.3.1.1 Rate: 10 Hz to 1 MHz
 - 3.3.1.2 Width: 0.1 µs to 100 ms
 - 3.3.1.3 Rise/Fall Time: Less than 25 ns
 - 3.3.1.4 Overshoot/Undershoot/Ringing: ±2.0 dB maximum
 - 3.3.1.5 Settling Time: ±1.0 dB of the final value within 100 ns
 - 3.3.1.6 On/Off Ratio: Greater than 80 dB
- 3.3.2 Pulse Modulation (external)
 - 3.3.2.1 Rate: 10 Hz to 1 MHz
 - 3.3.2.2 Width: 0.1 µs to 100 ms
 - 3.3.2.3 Triggering: Rising or falling edge
 - 3.3.2.4 Sync Output: Modulation waveform, TTL compatible
- 3.4 Digital Sweep Characteristics
- 3.4.1 Range: 50 MHz to 26.5 GHz
- 3.4.2 Step Size: 1 kHz or less to 100 MHz
- 3.4.3 Step Time: Variable, 1 step/10 µs to at least 1 step/sec
- 3.4.4 Ramp Output: 0 to 10 volts, proportional to the frequency between selected sweep limits
- 3.4.5 Output Flatness: Within ±1.0 dB to 18 GHz; ±2.0 dB from 18 to 26.5 GHz
- 3.4.6 Sweep Mode: Auto (continuous), single, single step, reset
- 3.4.7 Sweep Trigger: External input for triggering sweep, TTL compatible
- 3.4.8 Pen Lift: TTL compatible output, high level during retrace
- 3.5 Power Meter
- 3.5.1 Frequency Range: 50 MHz to 26.5 GHz
- 3.5.2 External Measurement Range: +10 dBm to -30 dBm
- 3.5.3 Accuracy (indicated power level vs externally measured level):
 - ±1.0 dB (+10 dBm to -10 dBm); ±2.0 dB (-10 dBm to -30 dBm)
- 3.5.4 Display (digital): 3.5 digits minimum
- 3.5.4.1 Resolution: 0.1 dB minimum for all power readings
- 3.5.5 Input Connector: Precision 3.5 mm male or female (SMA compatible)

3.6 Frequency Counter *

- 3.6.1 Input Range: At least 100 MHz to 26.5 GHz
- 3.6.2 Resolution: At least 100 Hz
- 3.6.3 Sensitivity: -25 dBm to 18 GHz; -20 dBm from 18 to 26.5 GHz
- 3.6.4 Mode: CW or Pulsed RF Input
- 3.6.4.1 Minimum PW for Pulsed RF Input: 0.5 μ s
- 3.6.5 Accuracy: At least 1 ppm
- 3.6.6 Input Impedance: 50 ohms nominal
- 3.6.7 Input Connector: Precision 3.5 mm male or female (SMA compatible)

4.0 GENERAL REQUIREMENTS

- 4.1 Power: 115/230 Vac \pm 10% single phase, 50, 60 or 400 Hz, 350 watts maximum
- 4.2 Lithium Batteries: Per MIL-T-28800, lithium batteries are prohibited without prior authorization. Requests for approving the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.
- 4.3 Volume: Less than 65,548 cm³ (4000 in³)
- 4.4 Weight: Less than 29.1 kg (64 lb)
- 4.5 Calibration Interval: The calibration interval shall be 12 months minimum. The equipment shall be within all accuracy requirements specified herein, with a 72% or greater confidence factor following a calibration interval of 12 months.
- 4.6 Remote Programming: The generator shall be capable of being remotely controlled via a RS-232 interface, operating as both a talker and listener, having control of at least the following parameters is required.

Output Frequency	External Power Measure
Output Amplitude (-99 to +5 dBm)	External Frequency Measure
Sweep Function	Modulation: 1 usec PW; 1 kHz PRF
Frequency Lock Status	Amplitude Level Status
- 4.6.1 In FE mode: Capable of controlling external frequency and amplitude of frequency extender via external cable
- 5.0 ACCESSORIES: The following list of accessories shall be provided with each equipment.
- 5.1 Microwave Coaxial Cables
 - 5.1.1 One Gore-tex GMCA 190-1265 or equivalent coaxial cable, 24 ft long, with male precision 3.5mm SMA compatible connectors or equivalent on each end
 - 5.1.2 One Gore-tex GMCA 190-1265 or equivalent, 6 ft long, with male precision 3.5mm SMA compatible connectors or equivalent on each end
 - 5.1.3 One Gore-tex GMCA 190-1265 or equivalent, 18 in long, with male precision 3.5mm SMA compatible connectors or equivalent on each end
- 5.2 Interface Cables

- 5.2.1 (2) RS-232, male one end, female other end, 50 ft length
- 5.2.2 (2) RS-232, male one end, female other end, 25 ft length
- 5.2.3 FE (1) Source-to-Frequency Extender connection cable, male both ends, 25 ft length
- 5.3 Adapters
- 5.3.1 One male to female adapter with precision 3.5 mm SMA compatible connector or equivalent
- 5.3.2 One female to female adapter with precision 3.5 mm SMA compatible connector or equivalent
- * Frequency counter may be supplied as a separate piece of equipment; however, weight and volume restrictions apply to signal generator packages only.

PURCHASE DESCRIPTION

SYSTEM CONTROLLER

- 1.0 GENERAL DESCRIPTION This procurement requires a computer/system controller capable of interfacing with external instruments in both IEEE-488 and RS-232 bus configurations. In addition the controller must possess the following internal features: (1) typewriter keyboard with separate numeric pad, (2) screen for display of program interface with operator, (3) hardcopy printer for permanent output of test results, (4) memory device (tape or disc) for storage of data and programs.
- 2.0 CLASSIFICATION The requirements of MIL-T-28800() are hereby waived for this device. The following operating conditions are imposed:
 - a. The operating temperature requirement is limited to the range of 15°C to 35°C and the non- operating temperature requirement is limited to the range of 0°C to 50°C.
- 3.0 OPERATIONAL REQUIREMENTS
- 3.1 Storage (capacity and medium)
- 3.1.1 RAM: At least 32 kbytes
- 3.1.2 Mass: Magnetic; at least 200 kbytes Amplitude Level Status
- 3.2 Language
- 3.2.1 HP Enhanced Basic
- 3.2.2 Compatibility: Must be compatible with previously prepared software.
- 3.3 Printer (hardcopy output)
- 3.3.1 Type: Thermal with bidirectional printing head; ink is not acceptable.
- 3.3.2 Line Length: At least 32 characters
- 3.3.3 Character Size: At least 10 point
- 3.4 Operator Interface
- 3.4.1 Display
- 3.4.1.1 Type: CRT or LCD
- 3.4.1.2 Size: 103 cm² (16 in²) minimum
- 3.4.1.3 Lines: 16 minimum
- 3.4.1.3.1 Length: 32 characters minimum
- 3.4.1.4 Graphics: At least 256 x 196 pixels

- 3.4.2 Keyboard: Full size typewriter-like alphanumeric with separate numeric keypad
- 3.4.3 Special Function Keys: At least 8 available; function to be defined by operator
- 3.4.4 Built-in Debugging Facilities
- 3.5 Features
 - 3.5.1 IEEE-488() Interface: Capable of communicating with external instruments as both talker and listener
 - 3.5.2 RS-232 Serial Interface (with male connector): Capable of communicating with external instruments as both talker and listener
 - 3.5.3 Clock: Built in system clock
 - 3.5.3.1 Timers: At least 3 independent timers
 - 3.5.4 Expansion Capability: A minimum of four ports for interfacing and expansion
 - 3.5.5 Full Self-test Capability
- 4.0 GENERAL REQUIREMENTS
 - 4.1 Power Source: 115/230 Vac $\pm 10\%$ single phase, 50, 60 or 400 Hz, 50 VA maximum
 - 4.2 Lithium Batteries: Per MIL-T-28800, lithium batteries are prohibited without prior authorization. Requests for approving the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.
 - 4.3 Dimensions: The total volume of the unit shall not exceed 40967 cm³ (2500 in³).
 - 4.4 Weight: The overall weight of the unit shall be less than 11.4 kg (25 lb).
 - 4.5 Calibration Interval: Shall be capable of qualifying for the Navy "No Calibration Required" label
- 5.0 ACCESSORIES
 - 5.1 ROM-drawer: Holds up to 6 external ROMs
 - 5.2 I/O ROM
 - 5.3 Advanced Programming ROM

PURCHASE DESCRIPTION
COUNTERMEASURES TEST SET ACCESSORIES

- 1.0 GENERAL DESCRIPTION These accessories are required for use with the CMTS in order to permit radiated measurements to be performed using the system.
- 2.0 CLASSIFICATION The requirements of MIL-T-28800() are hereby waived for these accessories.
- 3.0 OPERATIONAL REQUIREMENTS
 - 3.1 Test Antennas
 - 3.1.1 Spiral Antenna (0.3 to 1 GHz): Antenna Corp of America M/N 3127-RC-N
 - 3.1.1.1 Antenna Mount Adapter (Giga-tronics Stock #198CF02600)
 - 3.1.2 Horn Antenna, Ridged Waveguide (1 to 12.4 GHz): American Electronic Lab M/N H1479
 - 3.1.3 Horn Antenna, Ridged Waveguide (2 to 18 GHz): American Electronic Lab M/N H1498-T
 - 3.1.4 Horn Antenna (18 to 26.5 GHz): Narda M/N 638
 - 3.1.4.1 Antenna Mount Adapter (A&T Technical Services M/N 81995 00 0002 29)
 - 3.1.5 Standard Gain Horn (26 to 40 GHz): Scientific Atlanta M/N 12A-26
 - 3.2 Adapters
 - 3.2.1 TNC (M) to SMA (F): Midwest Microwave M/N 2686
 - 3.2.2 Type N (M) to SMA (F): Omni Spectra M/N 3082-2240-00
 - 3.2.3 Waveguide-to-coax Adapter (18 to 26.5 GHz): Omni Spectra M/N 2000-6256
 - 3.3 Fixed Attenuators
 - 3.3.1 Waveguide WR-28
 - 3.3.1.1 15 dB
 - 3.3.1.2 20 dB
 - 3.3.1.3 30 dB
 - 3.4 Antenna Mounting Hardware Case
 - 3.4.1 Part #81995-00-002: Used to physically attach test antennas to existing superstructure when performing radiated systems testing
 - 3.5 Shipping/Carrying/Storage Cases
 - 3.5.1 Cases
 - 4 Giga-tronics PCCO 01001
 - 1 Giga-tronics PCCO 02001
 - 3.5.2 Case Liners
 - 1 Giga-tronics PCCL 01001
 - 1 Giga-tronics PCCL 01002
 - 1 Giga-tronics PCCL 01003
 - 1 Giga-tronics PCCL 01004
 - 1 Giga-tronics PCCL 02001

PURCHASE DESCRIPTION

WIDEBAND MICROWAVE FREQUENCY EXTENDER

- 1.0 GENERAL DESCRIPTION This procurement requires an all solid state, synthesized, microwave frequency extender covering the frequency range of 26 to 40 GHz using input frequencies of 13 to 20 GHz at +5 to -7 dBm. The output level of the extended frequency shall be variable from at least +5 to -15 dBm leveled.
- 2.0 CLASSIFICATION The frequency extender described herein shall meet the requirements of MIL-T-28800(), Type III, Class 5, Style E, Color R for Navy shipboard, submarine, and shore applications.
- 3.0 OPERATIONAL REQUIREMENTS
 - 3.1 Frequency Characteristics
 - 3.1.1 Output Frequency Range: At least 26 to 40 GHz
 - 3.1.2 Input Frequency Range: At least 13 to 20 GHz
 - 3.1.3 Output Frequency Resolution: 2 times the resolution of the input frequency
 - 3.1.4 Output Frequency Accuracy: Same as the input frequency
 - 3.1.5 Output Frequency Stability: Input stability degraded by factor of 2
 - 3.1.6 Spectral Purity
 - 3.1.6.1 Harmonics/Sub-harmonics: At least -20 dBc
 - 3.1.6.2 Non-Harmonics/Spurious: At least -20 dBc
 - 3.1.7 Frequency Display: The output frequency shall be displayed directly on the extender's front panel or remotely on its driving source synthesizer.
 - 3.2 Output Characteristics
 - 3.2.1 Output Level: -15 dBm to +5 dBm leveled for input levels of at least -2 dBm
 - 3.2.2 Output Level Resolution: 0.1 dBm
 - 3.2.3 Output Level Display: The output level shall be displayed directly on the extender's front panel or remotely on its driving source synthesizer.
 - 3.2.4 Output Level Control
 - 3.2.4.1 Local Operation: The output level of the frequency extender shall be controllable from the unit's front panel when operating under manual control. An indicator shall be provided indicating the leveled status of the output of the extender.
 - 3.2.4.2 Remote Operation: The output level of the frequency extender shall be controllable from the signal generator.
 - 3.2.5 Output Level Accuracy: ± 2.5 dB
 - 3.2.6 Output Level Flatness: ± 2.5 dB
 - 3.2.7 Output Connector: WR-28 WG waveguide with type UG-599/U flange
 - 3.2.7.1 Impedance: 50 Ω nominal
 - 3.2.7.2 VSWR: Less than 2:1 worst case

3.2.8 Input Connector: Precision 3.5 mm male or female (SMA compatible)

3.3 Modulation Characteristics

3.3.1 Pulse/Square Wave Modulation

3.3.1.1 Rate: 100 Hz to 50 kHz minimum

3.3.1.2 Width: 0.1 to 10 μ sec minimum

4.0 GENERAL REQUIREMENTS

4.1 Power: 115/230 Vac \pm 10% single phase, 50, 60 or 400 Hz, 20 watts maximum

4.2 Lithium Batteries: Per MIL-T-28800, lithium batteries are prohibited without prior authorization. Requests for approving the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

4.3 Volume: Less than 9850 cm³ (600 in³)

4.4 Weight: The overall weight of the unit shall not exceed 4.5 kg (10 lb).

4.5 Calibration Interval: The calibration interval shall be 12 months minimum. The equipment shall be within all accuracy requirements specified herein, with a 72% or greater confidence factor following a calibration interval of 12 months.

4.6 Interface Control: Level must be remotely controllable through the synthesized, wideband microwave signal generator driving source via an external cable.

PURCHASE DESCRIPTION

DIGITAL VOLTMETER

- 1.0 GENERAL DESCRIPTION This procurement requires an all solid state, true rms, digital voltmeter for use with the Countermeasures Test Set.
- 2.0 CLASSIFICATION The voltmeter described herein shall meet the requirements of MIL-T-28800(), Type III, Class 5, Style E, Color R for Navy shipboard, submarine and shore applications.
- 3.0 OPERATIONAL REQUIREMENTS
 - 3.1 Measurement Ranges
 - 3.1.1 DC Voltage: 0 to ± 300 V
 - 3.1.1.1 Resolution: At least 1 mV for 20 V full scale reading
 - 3.1.2 AC Voltage: 50 μ V to 300 V (true rms)
 - 3.1.2.1 Frequency Response: 10 Hz to 10 MHz
 - 3.1.2.2 Resolution: At least 1 mV for 20 V full scale reading
 - 3.2 Input Connector: Binding posts (balanced) or BNC female (unbalanced)
 - 3.2.1 Input Impedance: At least 1 M Ω shunted by < 50 pF
 - 3.2.2 Common Mode Rejection: > 80 dB for ac; > 120 dB for dc
 - 3.3 Measurement Rate: At least 2 or more readings/sec
 - 3.4 Accuracy
 - 3.4.1 DC: Within $\pm 0.5\%$ of range selected
 - 3.4.2 AC: Within $\pm 2\%$ of range selected
 - 3.4.2.1 Maximum Crest Factor: 4
 - 3.5 Display: At least 4 1/2 digit display
 - 3.5.1 Units: Volts ac and dc
- 4.0 GENERAL REQUIREMENTS
 - 4.1 Power: 115/230 Vac $\pm 10\%$ single phase, 50, 60 or 400 Hz, 40 VA maximum
 - 4.2 Lithium Batteries: Per MIL-T-28800, lithium batteries are prohibited without prior authorization. Requests for approving the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.
 - 4.3 Dimensions: 25.4 cm x 35.56 cm x 10.16 cm (10 in x 14 in x 4 in)
 - 4.3.1 Volume: 9200 cm³ (560 in³)
 - 4.4 Weight: 4.5 kg (10 lb) maximum
 - 4.5 Calibration Interval: The calibration interval shall be 12 months minimum. The equipment shall be within all accuracy requirements specified herein, with a 72% or greater confidence factor following a calibration interval of 12 months.

- 4.6 Remote Operation: All front panel functions controllable via IEEE-488() interface bus
- 4.6.1 Talker Function: Unit capable of sending readings via IEEE-488() to system controller